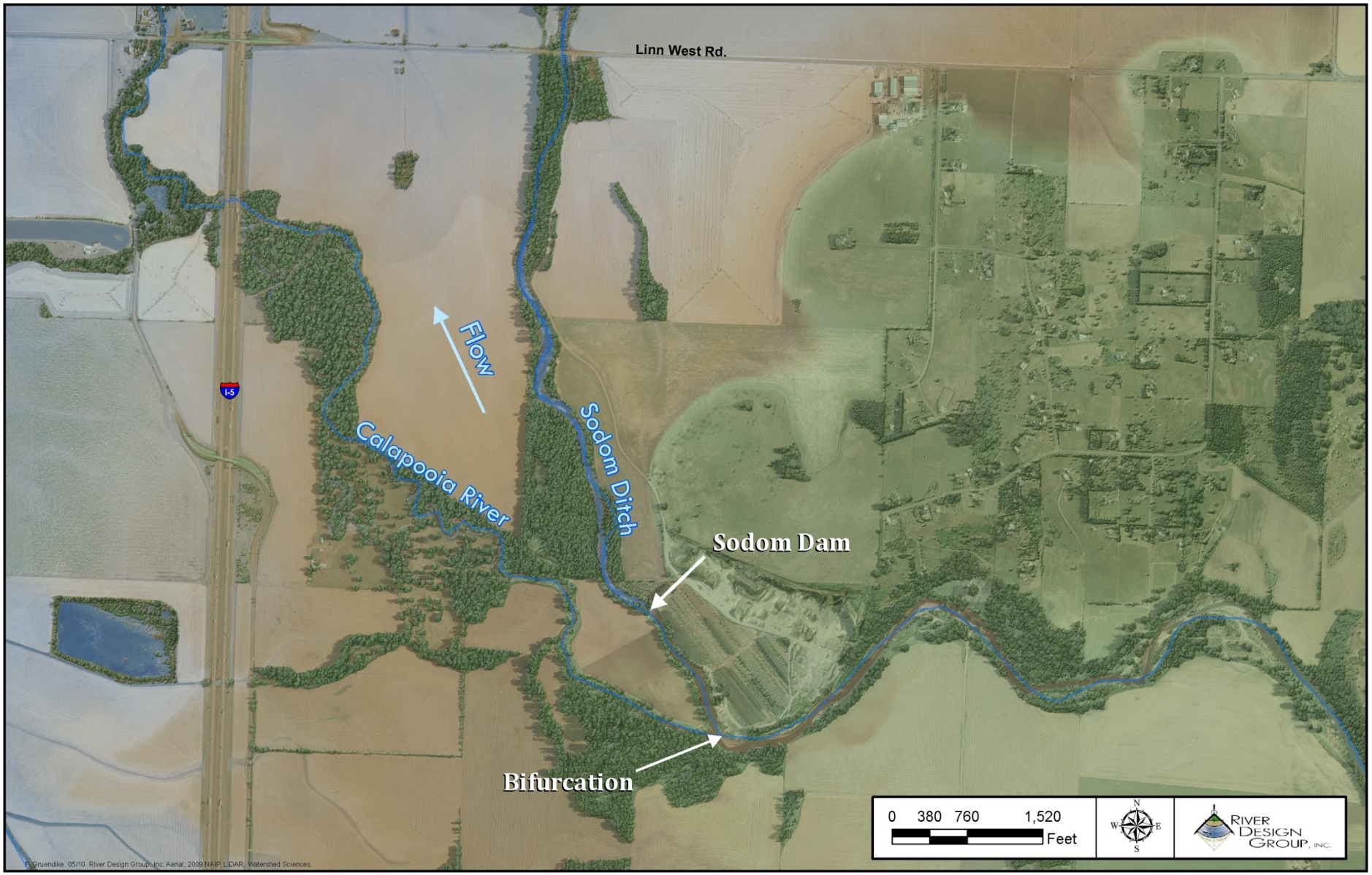
Calapooia – Sodom Bifurcation Performance



Calapooia-Sodom Bifurcation Performance

- Review how we arrived today's configuration of the bifurcation
- Provide field data for actual split flow conditions
- Discuss project objectives for the bifurcation and how it is performing

Roadmap to Today

- February 2009, held first landowner outreach meeting, talked about river processes
- Initiated additional studies of the Calapooia-Sodom channels to complement the existing studies by OPRD
- Started the discussion on alternatives for the Sodom and Shearer dams
- May 2009, held second landowner outreach meeting with information on Sodom Ditch and alternatives

Findings for Sodom Ditch

- Alternating gravel bars with bank erosion developing in first 2 miles downstream (pool-riffle sequences) and other parts of the ditch
- Gravel extraction in Calapooia main stem reduced in 2000 and will likely increase gravel bars and erosion in Sodom Ditch
- Clay streambed inclusions provide grade control in Sodom Ditch
- Areas of limited riparian buffer create potential for significant future erosion of streambanks

Project Alternatives

(1) Interim Action

- Implement fish passage improvements at all dams
- Develop replacement plan for deteriorated structures

(2) Fish Passage

- Install new fish ladders that meet current criteria
- Develop specific flow regime and adaptive management plan

(3) Restore Calapooia as Mainstem

- Excavate or initiate natural river processes to reclaim channel
- Relocate existing homes or realign mainstem

(4) Sodom Ditch as Mainstem

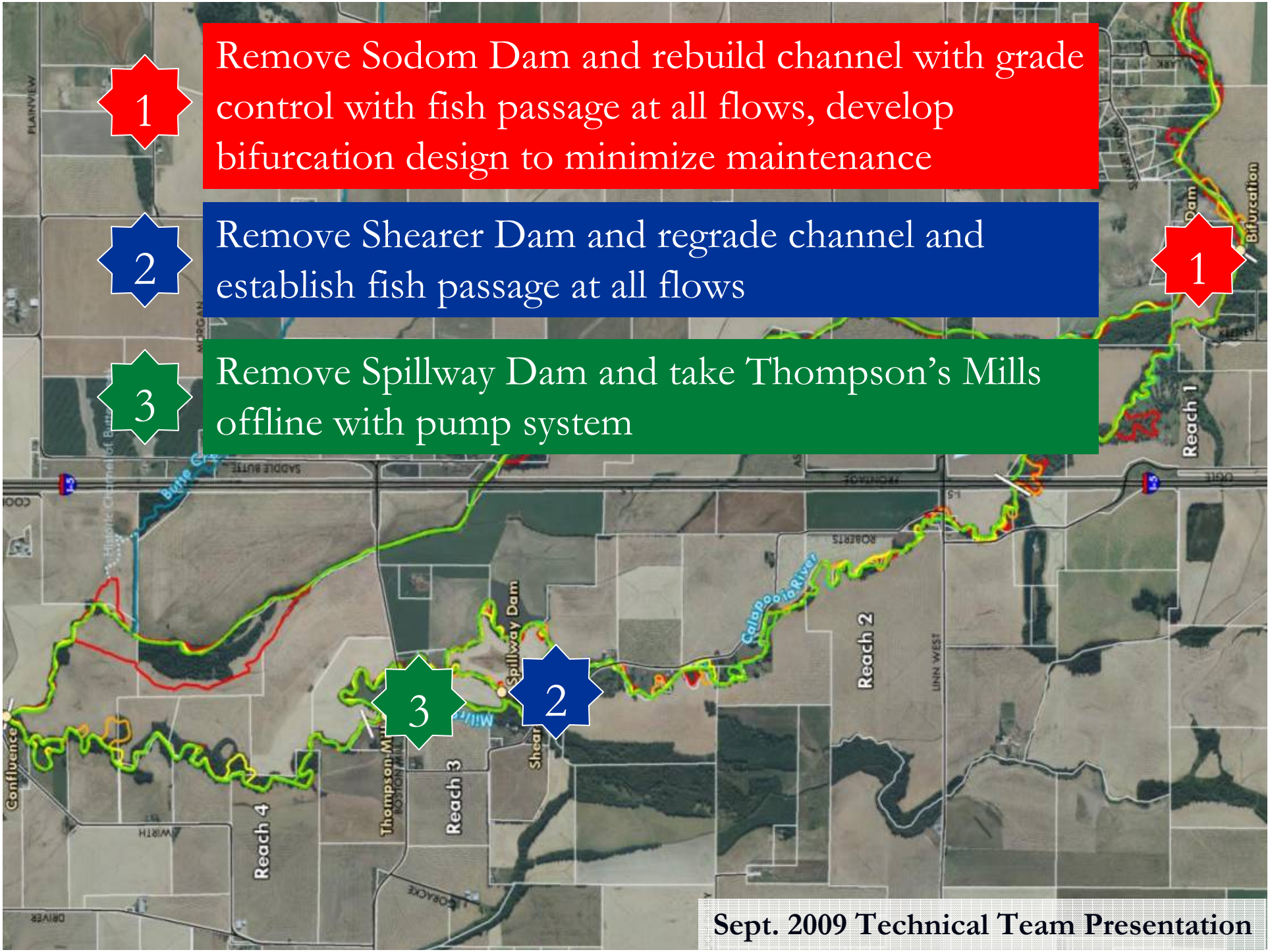
- Remove dam and establish grade control – natural channel
- Add habitat features to Sodom Ditch

(5) Variable Flow Management

- Incrementally transition Sodom Ditch flows to Calapooia
- Install fish passage facilities at Shear & Spillway Dams

Roadmap to Today

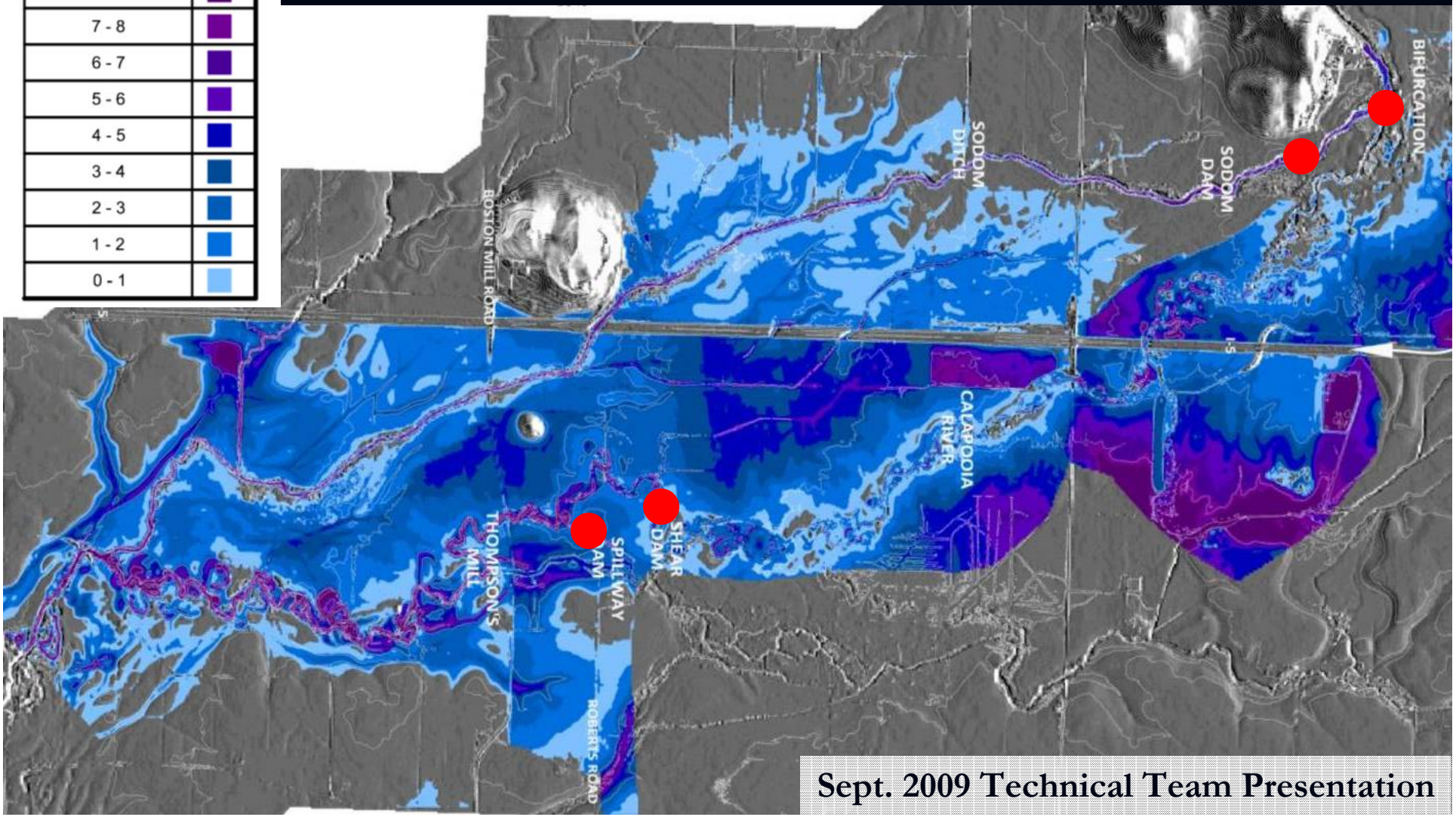
- October 2009, a preferred alternative was selected by landowners, technical team, and agencies that consisted of various components from several of the potential alternatives



Sept. 2009 Technical Team Presentation

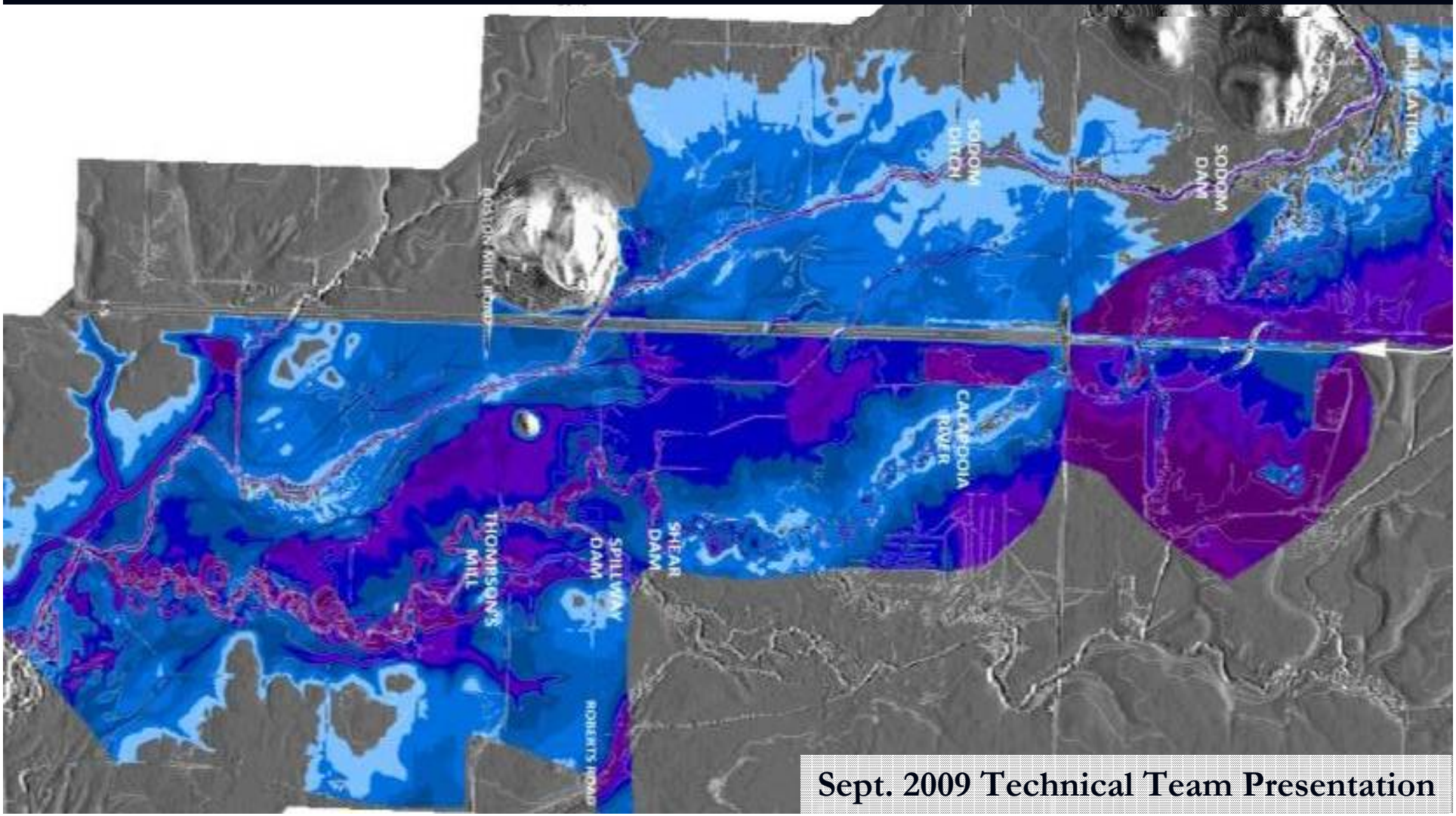
Hydraulic Modeling
2-yr Flow (7,000 cfs)

Inundation Depths	
Depth Range	Color
>8	
7 - 8	
6 - 7	
5 - 6	
4 - 5	
3 - 4	
2 - 3	
1 - 2	
0 - 1	



Sept. 2009 Technical Team Presentation

Hydraulic Modeling Results
10-yr Flow (13,000 cfs)



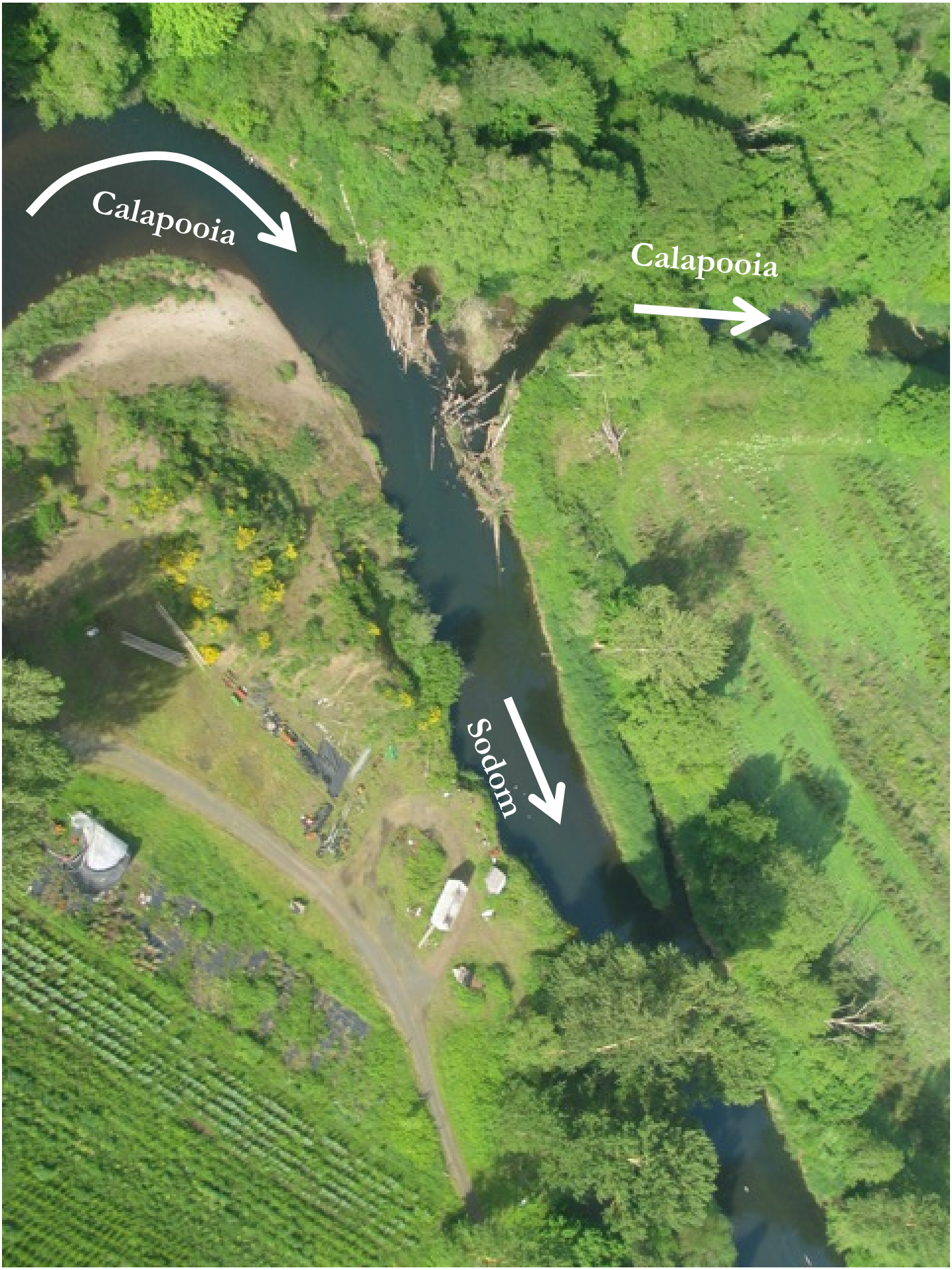
Sept. 2009 Technical Team Presentation

Bifurcation Design Principles

- **Maintain stability at the bifurcation**

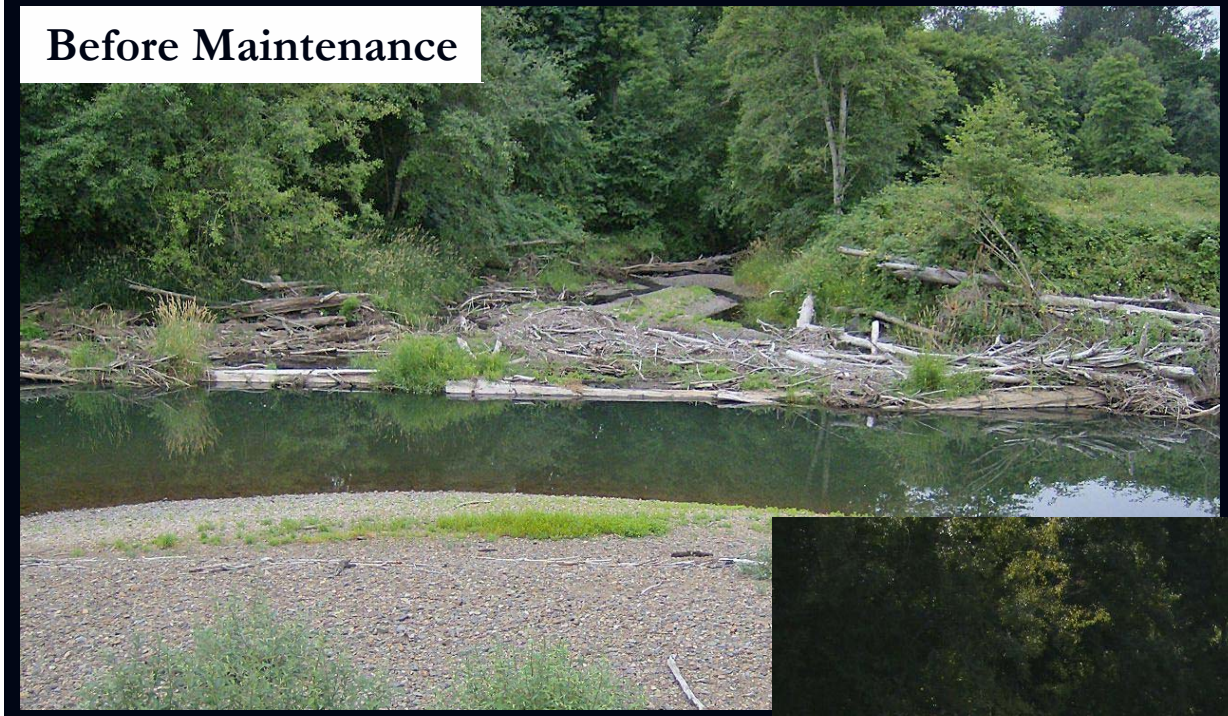
  --High shear stress and uniform velocities

- **Minimize maintenance**
- **Maintain flexibility for modifications**
- **Fish passage 100%**


Calapooia
Calapooia
Sodom

Bifurcation

Before Maintenance



After Maintenance

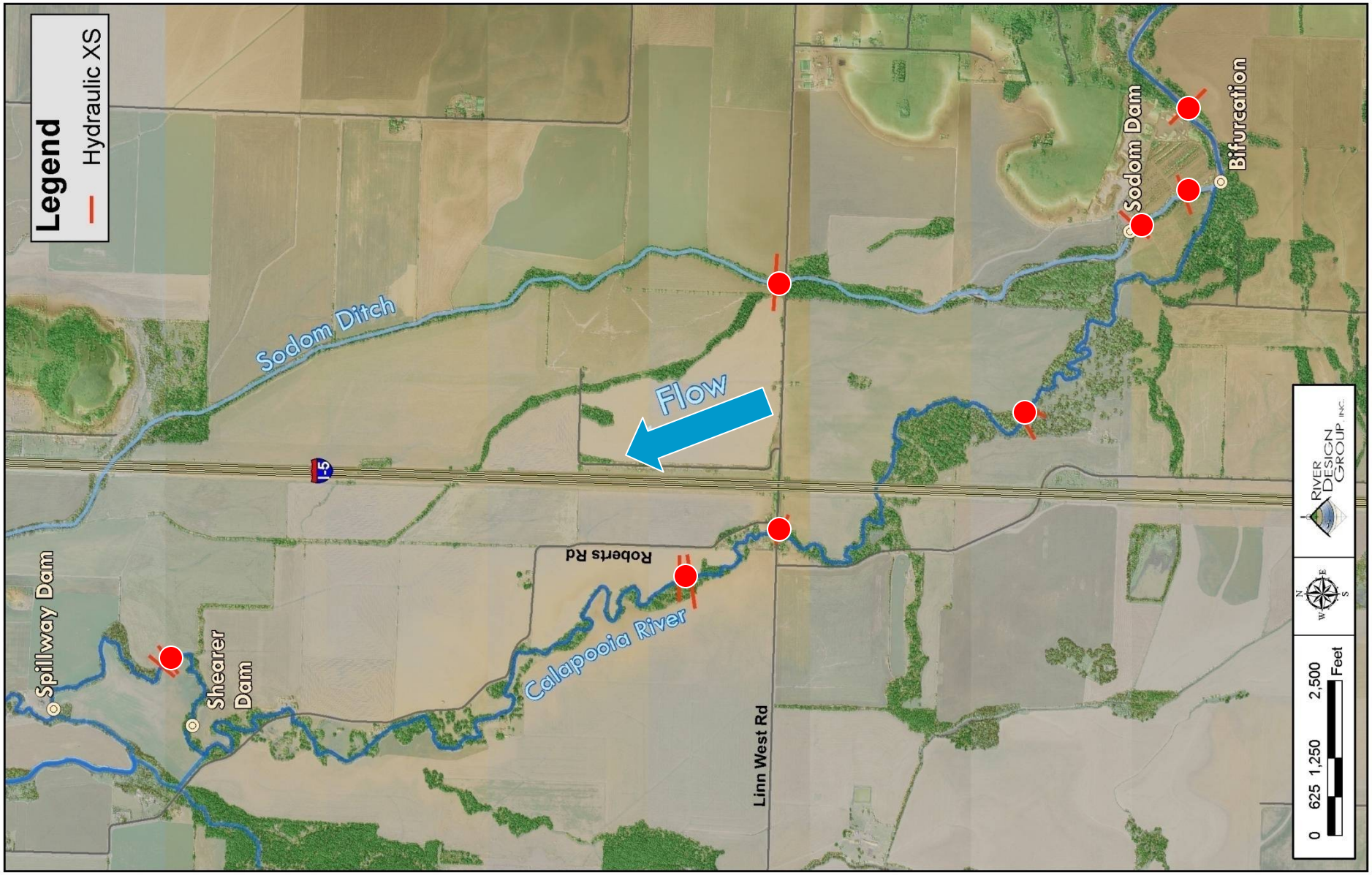
2006 photos from OPRD

Bifurcation

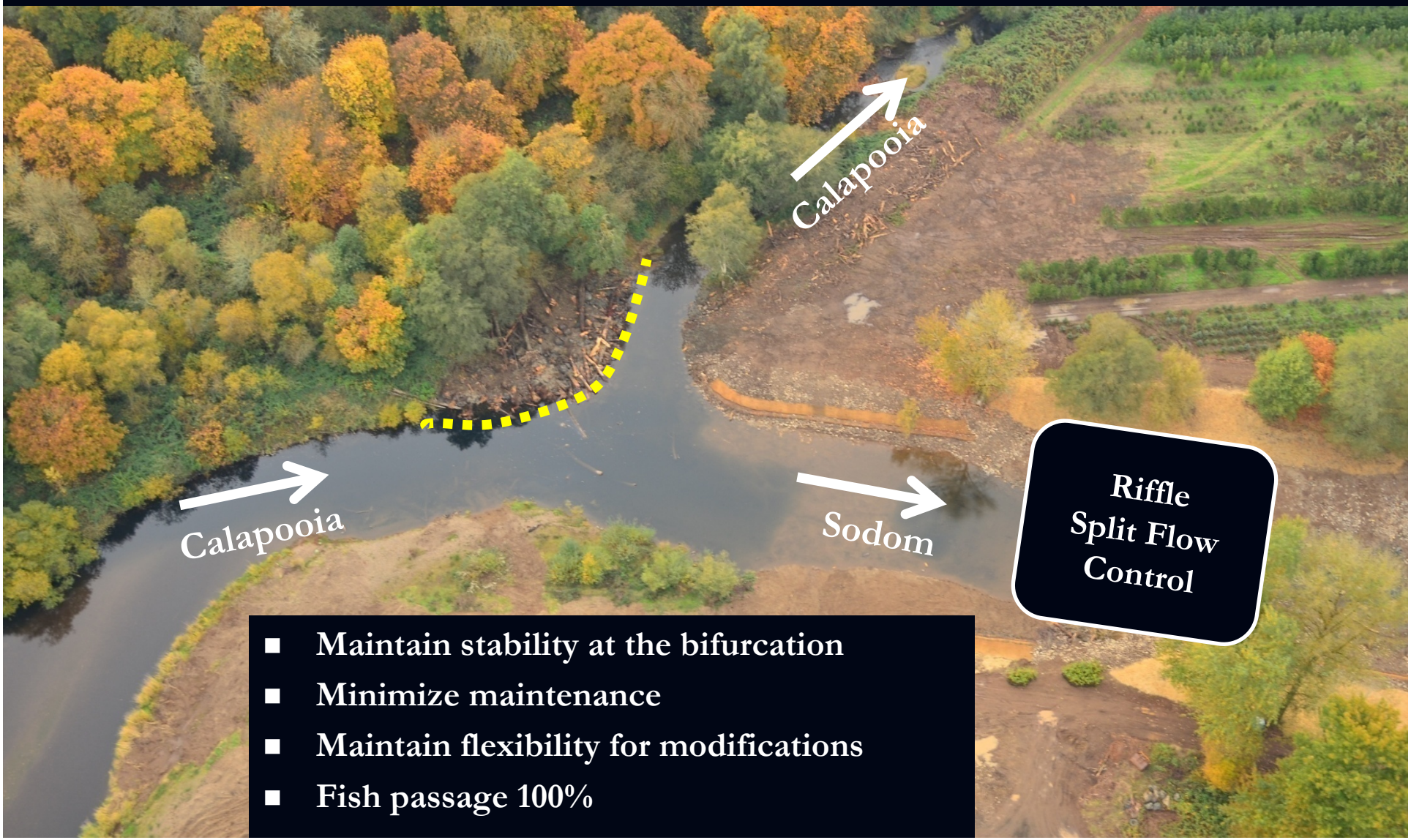
Bifurcation was on a trajectory of cutting off the Calapooia channel completely

Bifurcation

Hydraulic Measurement Sections

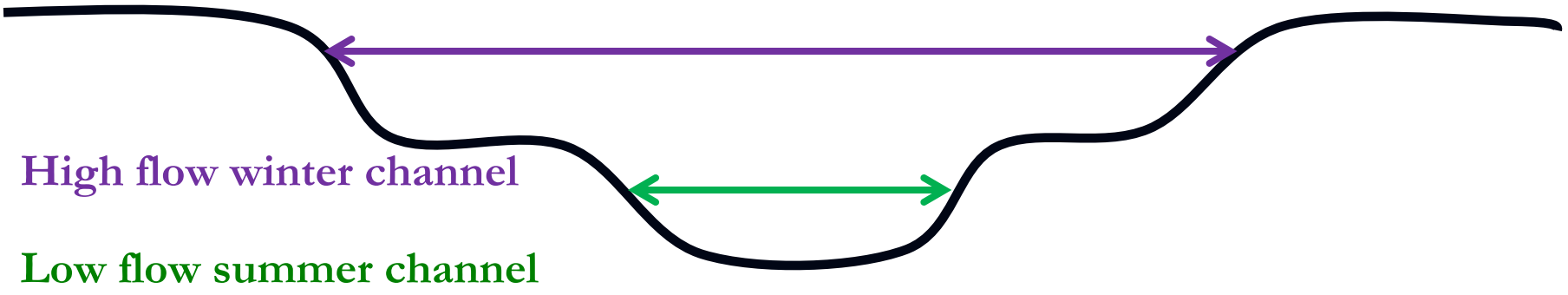


Bifurcation As-Built

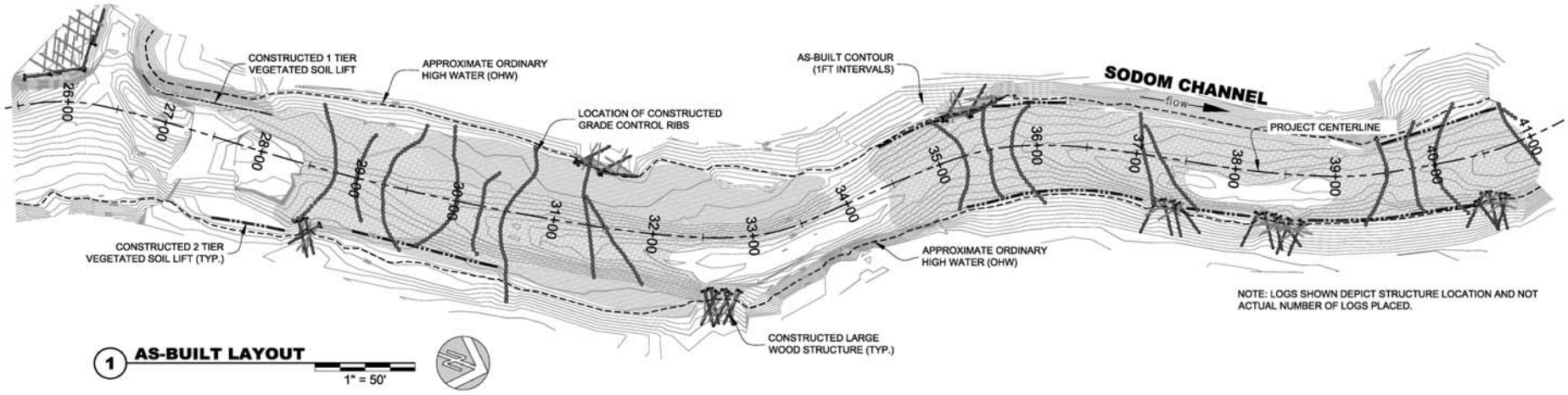


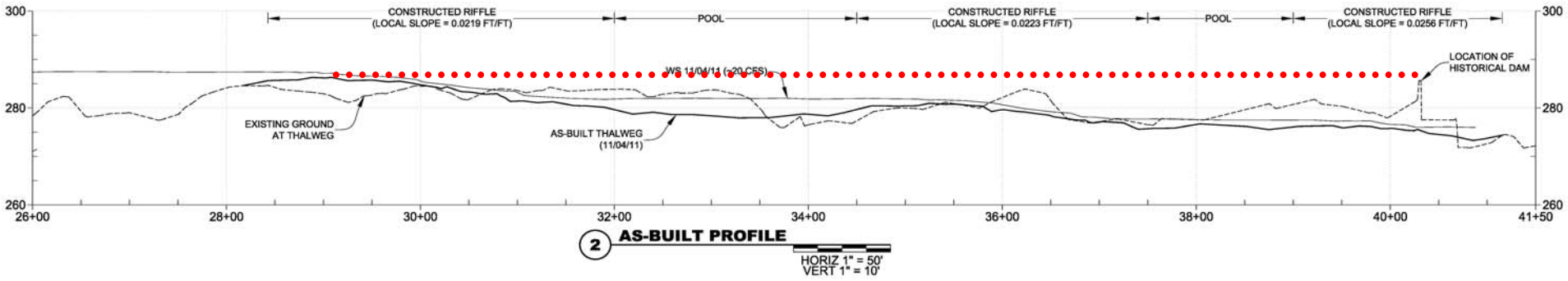
- Maintain stability at the bifurcation
- Minimize maintenance
- Maintain flexibility for modifications
- Fish passage 100%

Bifurcation Control Riffle



Elevations: As-built Profile





Bifurcation Control Riffle

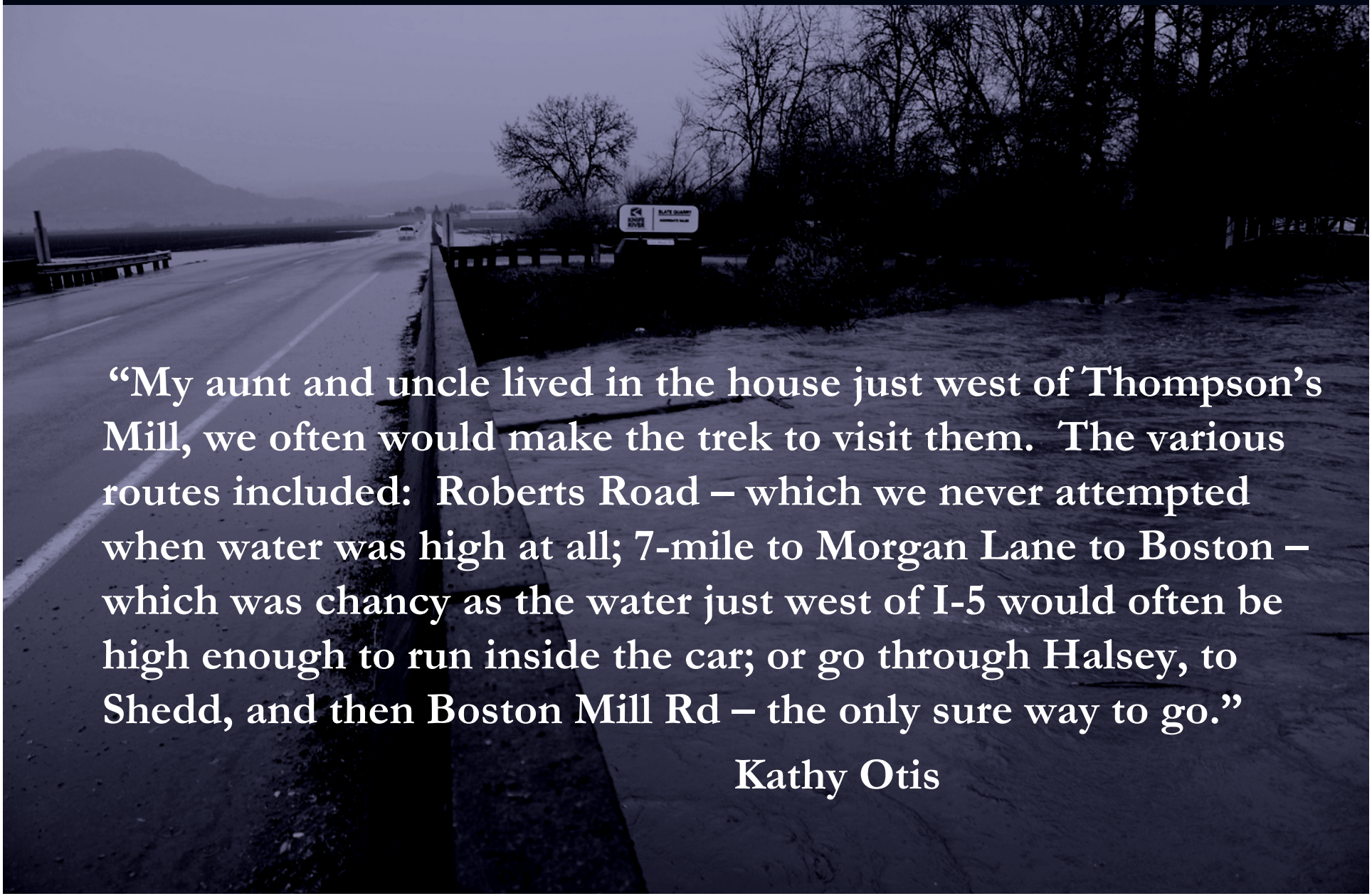

November 24 ,2011

Rain, Rain…and more Rain

- 8.10 inches of rain in 4 days in February 1996 (set a record) and 7.76 inches of rain in 4 days in January 2012

- The average rainfall for March is 4.55 inches and the mid-valley received 11.46 inches. The average year-to-date rainfall is 16.55 inches through April 2, and this year, we've received 27.03 inches…Albany Democrat Herald Newspaper

Historical Perspective



"My aunt and uncle lived in the house just west of Thompson's Mill, we often would make the trek to visit them. The various routes included: Roberts Road – which we never attempted when water was high at all; 7-mile to Morgan Lane to Boston – which was chancy as the water just west of I-5 would often be high enough to run inside the car; or go through Halsey, to Shedd, and then Boston Mill Rd – the only sure way to go."

Kathy Otis


December 30, 2011


January 19, 2012


January 22, 2012

Variable Flows over Riffles


March 29, 2012


March 30, 2012

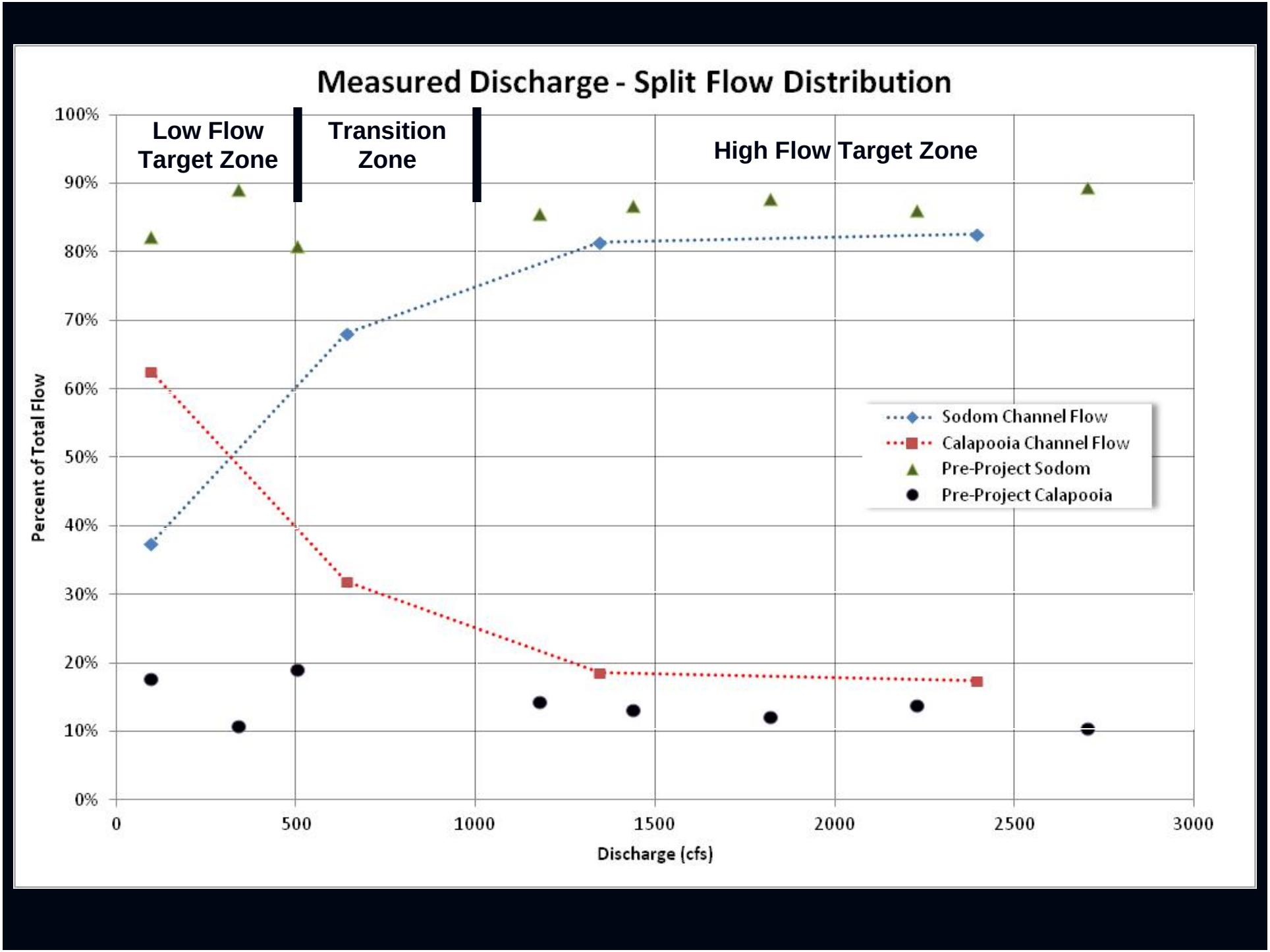
Flow Split Monitoring

Field Data Collection Date	Calapooia River at Linn West Discharge (cfs)	Calapooia River at Linn West Percent of Total Flow	Sodom Channel at Linn West Road Discharge (cfs)	Sodom Channel at Linn West Road Percent of Total Flow	Calapooia River Upstream of Bifurcation (cfs)
Nov. 5, 2009	17	18%	79	82%	96
June 16, 2010	96	19%	407	81%	503
Jan. 18, 2011	**309**	**14%**	**1920**	**86%**	**2229**
Feb. 8, 2011	37	11%	303	89%	340
March 10, 2011	221	12%	1600	88%	1821
March 16, 2011	284	11%	2420	89%	2704
April 7, 2011	**190**	**13%**	**1250**	**87%**	**1440**
April 8, 2011	170	14%	1010	86%	1180
Project Implementation					
December 22, 2011	60	63%	36	38%	96
January 4, 2012	204	32%	437	68%	641
February 22, 2012	**250**	**19%**	**1097**	**81%**	**1347**
March 23, 2012	**415**	**17%**	**1979**	**83%**	**2394**

Flow today in the Calapooia ~ 1,000 cfs

Table 2-1. Project Performance Standards to Ensure Compliance with Client Guidance

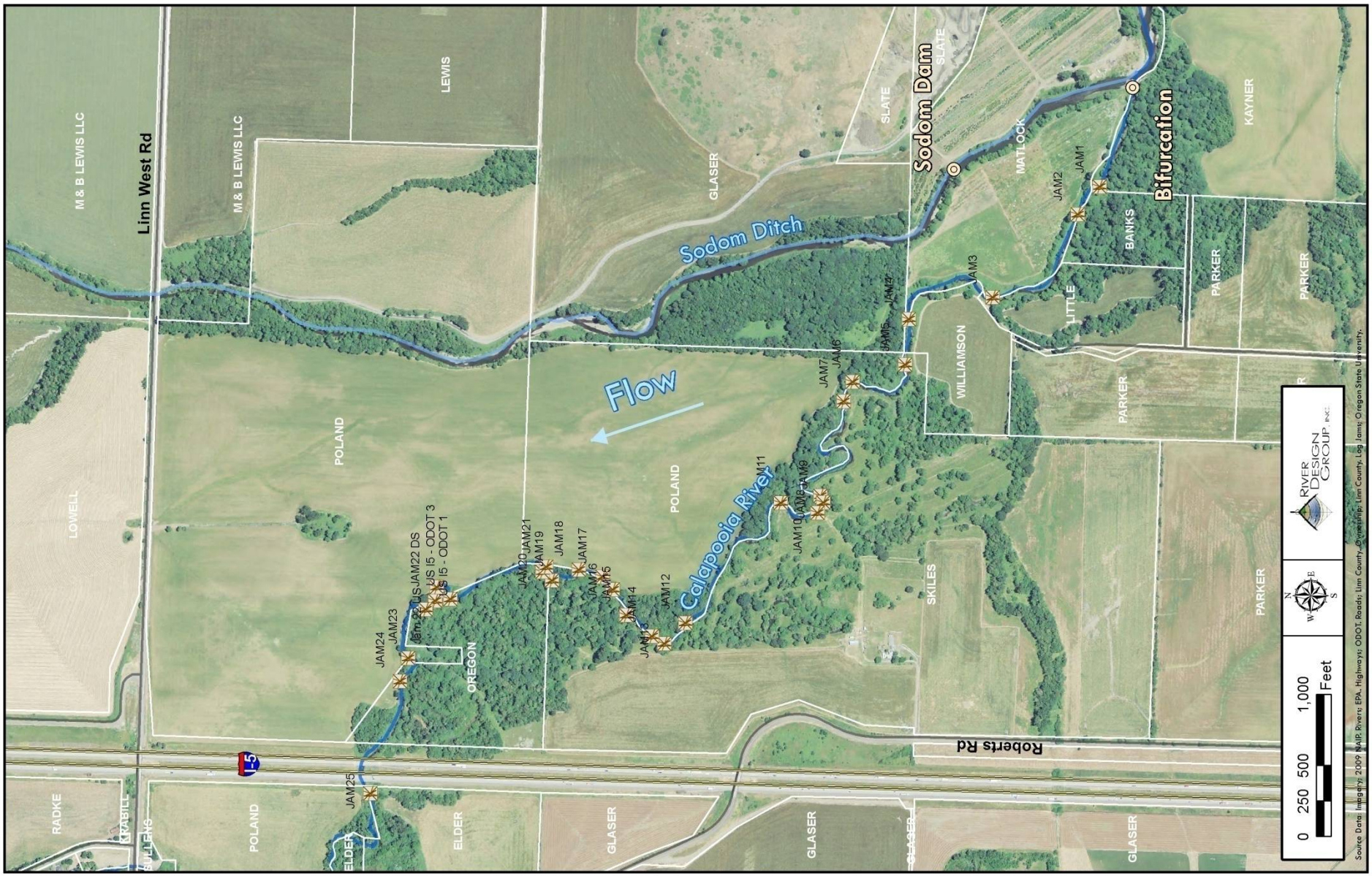
Metric	Short-term	Long-term
Sodom Ditch Channel Morphology		
Channel Cross-section area Mean depth Width:Depth ratio Channel slope	Design dimensions +/- 20% (design dimensions under development)	Design dimensions +/- 20% (design dimensions under development)
Channel morphology at 26+50 engineered riffle High flow water partitioning	Design dimensions +/- 20% (design dimensions under development) Maintain 70/30 high flow split with Calapooia River channel Maintain 50/50 base flow split with Calapooia River channel	Design dimensions +/- 20% (design dimensions under development) Maintain 70/30 high flow split with Calapooia River channel Maintain 50/50 base flow split with Calapooia River channel
Calapooia Channel Water Delivery		
Minimum channel inlet depth Base flow water partitioning	Design dimensions +/- 20% (design dimensions under development) Maintain 30/70 high flow split with Sodom Ditch Maintain 50/50 base flow split with Sodom Ditch	Design dimensions +/- 20% (design dimensions under development) Maintain 30/70 high flow split with Sodom Ditch Maintain 50/50 base flow split with Sodom Ditch
Vegetation		
Percent cover herbaceous vegetation	Greater than 90% cover of herbaceous vegetation in seeded area	Greater than 90% cover of herbaceous vegetation in seeded area
Riparian shrub layer	Greater than 70% cover of planted riparian shrub layer in project area	Greater than 90% cover of planted riparian shrub layer in project area


Measured Discharge - Split Flow Distribution
Low Flow Target Zone
Transition Zone
High Flow Target Zone
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Percent of Total Flow
0
500
1000
1500
2000
2500
3000
Discharge (cfs)
Sodom Channel Flow
Calapooia Channel Flow
Pre-Project Sodom
Pre-Project Calapooia

Log Jams in Calapooia

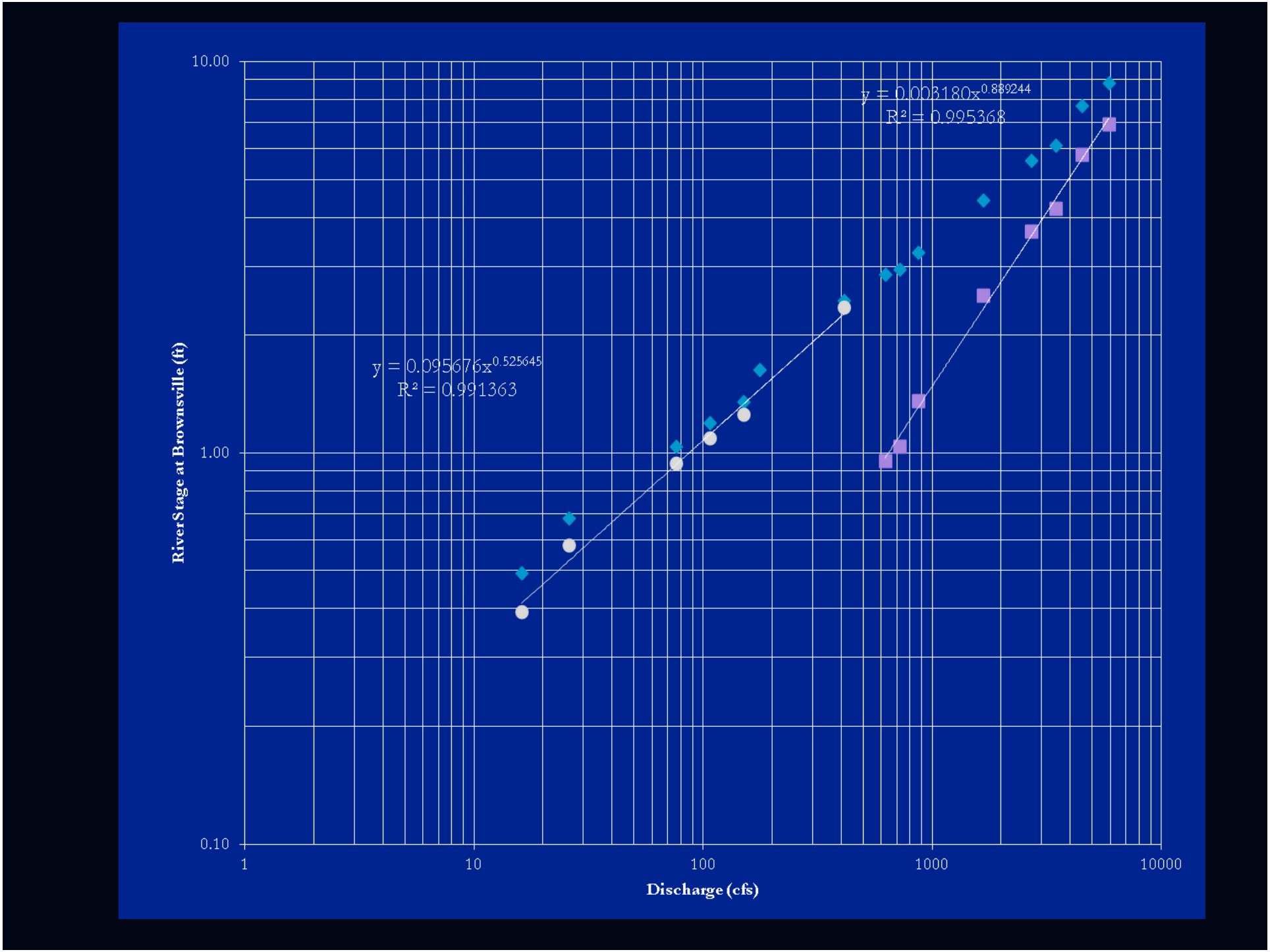
- OSU identified 25 log jams between bifurcation and I-5

Log Jams in Calapooia



Summary

- The bifurcation flow split is within the design parameters for high flow conditions of 70/30
- The design to minimize maintenance at the bifurcation appears to be working well
- The bifurcation is dynamic and can change after each large storm event


10.00
1.00
0.10
1
10
100
1000
10000
River Stage at Brownsville (ft)
Discharge (cfs)
y = 0.003180x^0.889244
R² = 0.995368
y = 0.095676x^0.525645
R² = 0.991363